

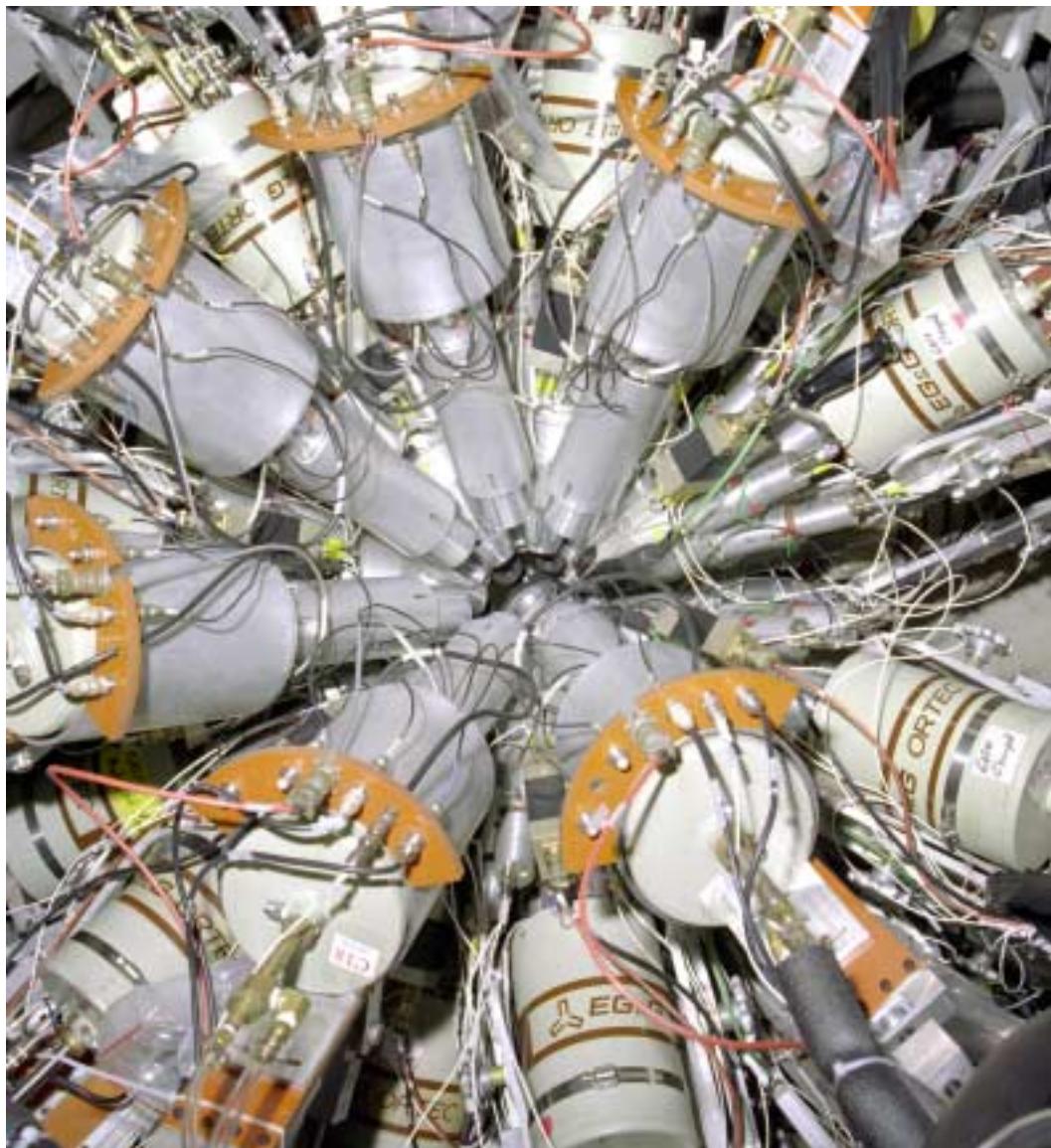
# $\gamma$ -ray detection techniques at RIA: SBSS applications

Matt Devlin  
LANSCE-3, Los Alamos  
National Laboratory

# Outline

- What we do now
  - examples
  - limitations
- What RIA offers
  - $\gamma$ -ray detectors
  - rare isotopes
- How to put these together...

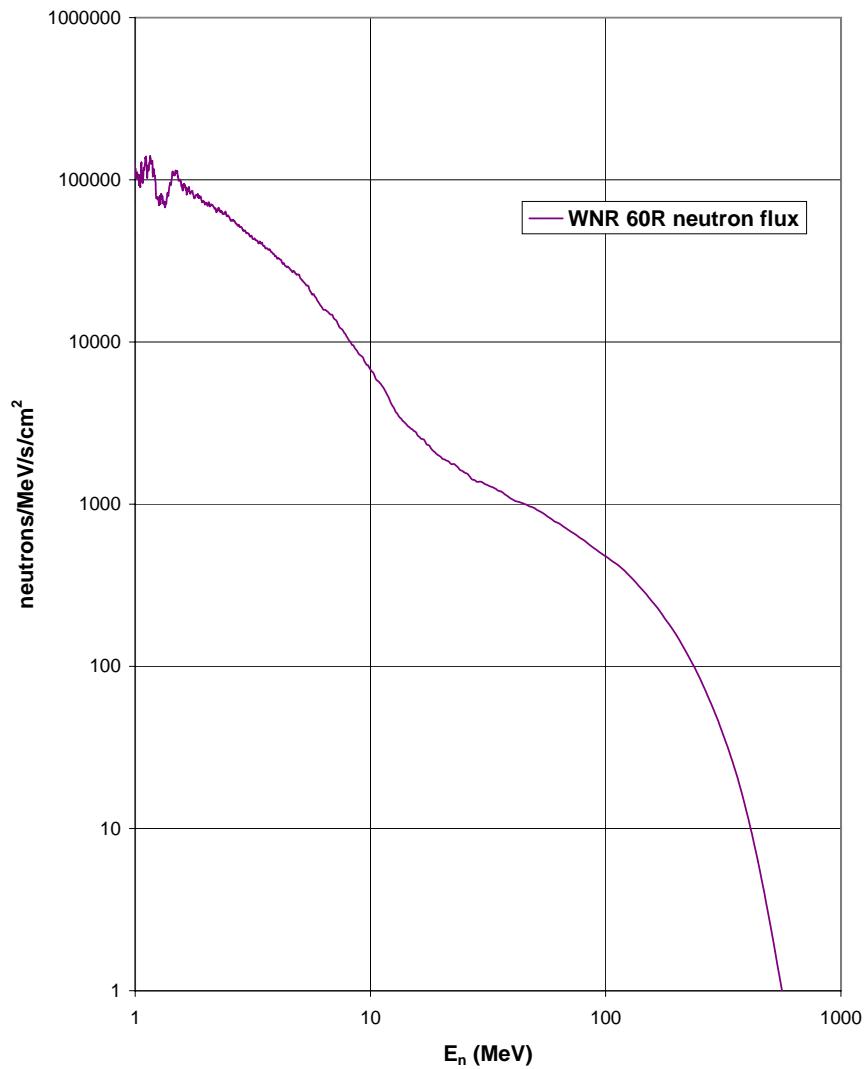
# GEANIE at WNR



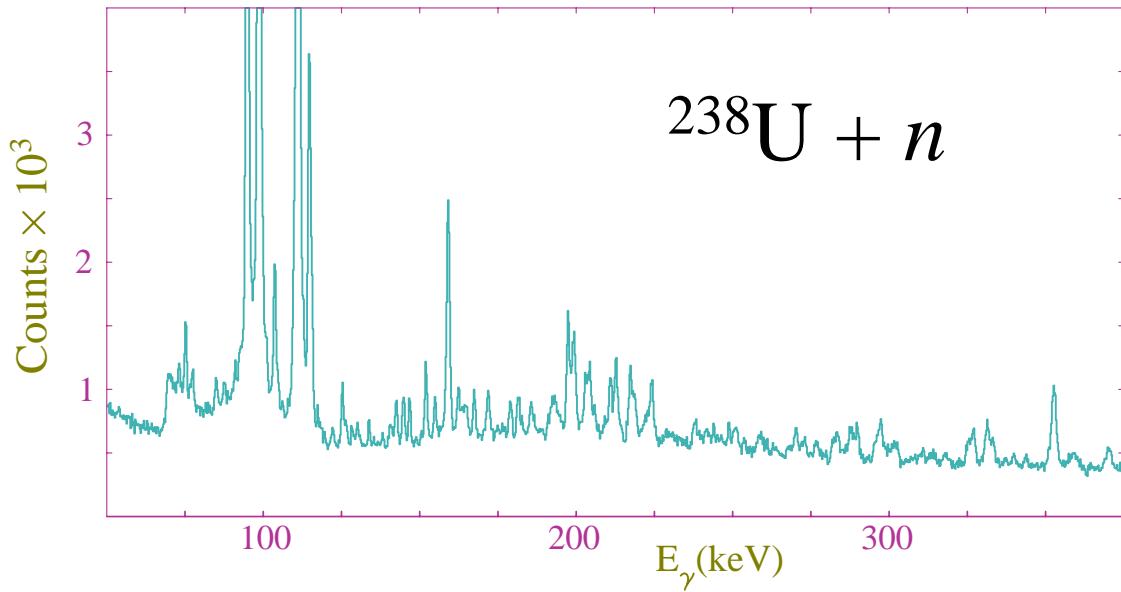
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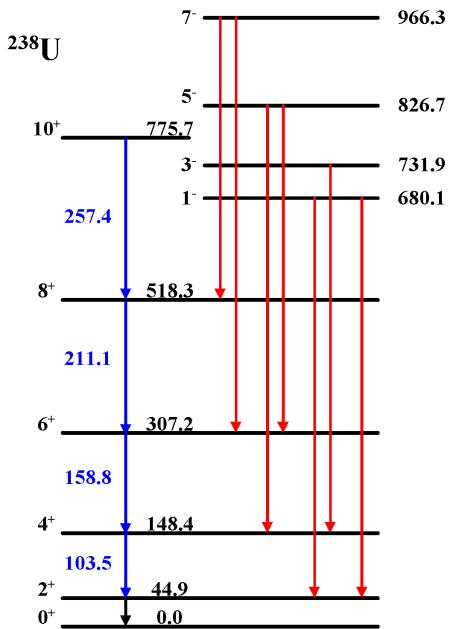
# WNR neutron flux



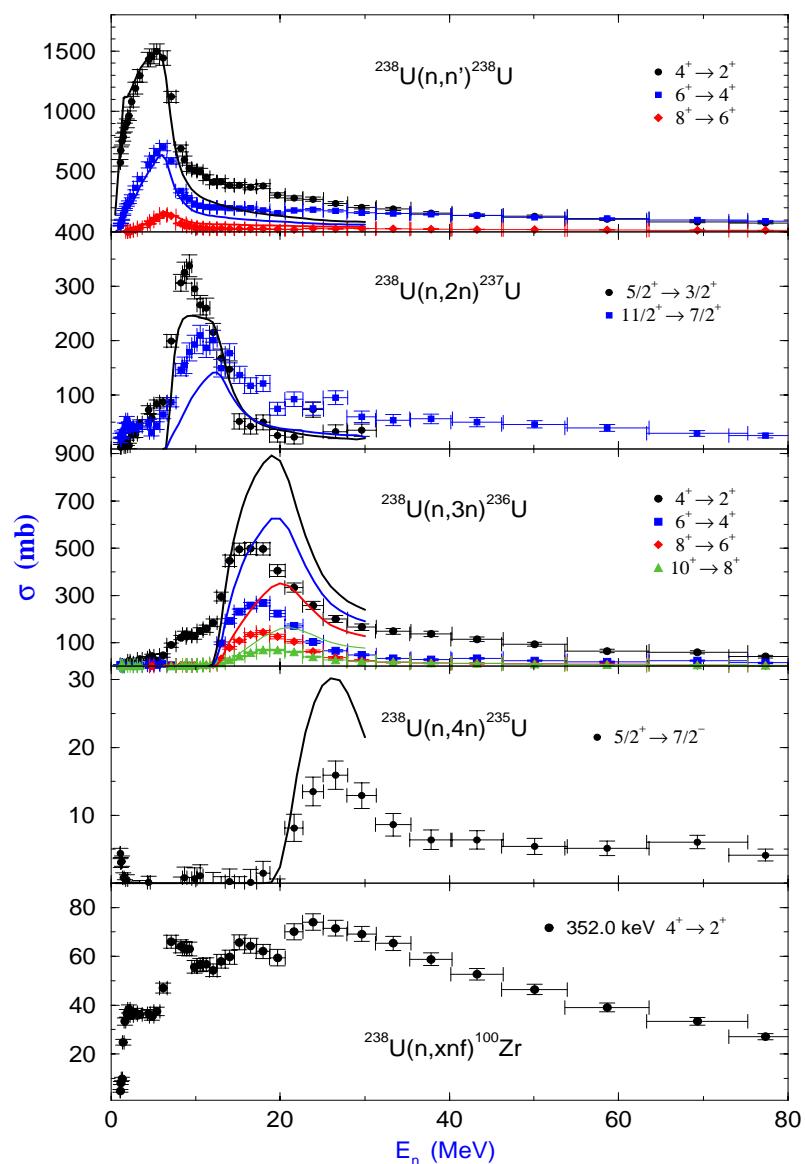
# Experimental Technique



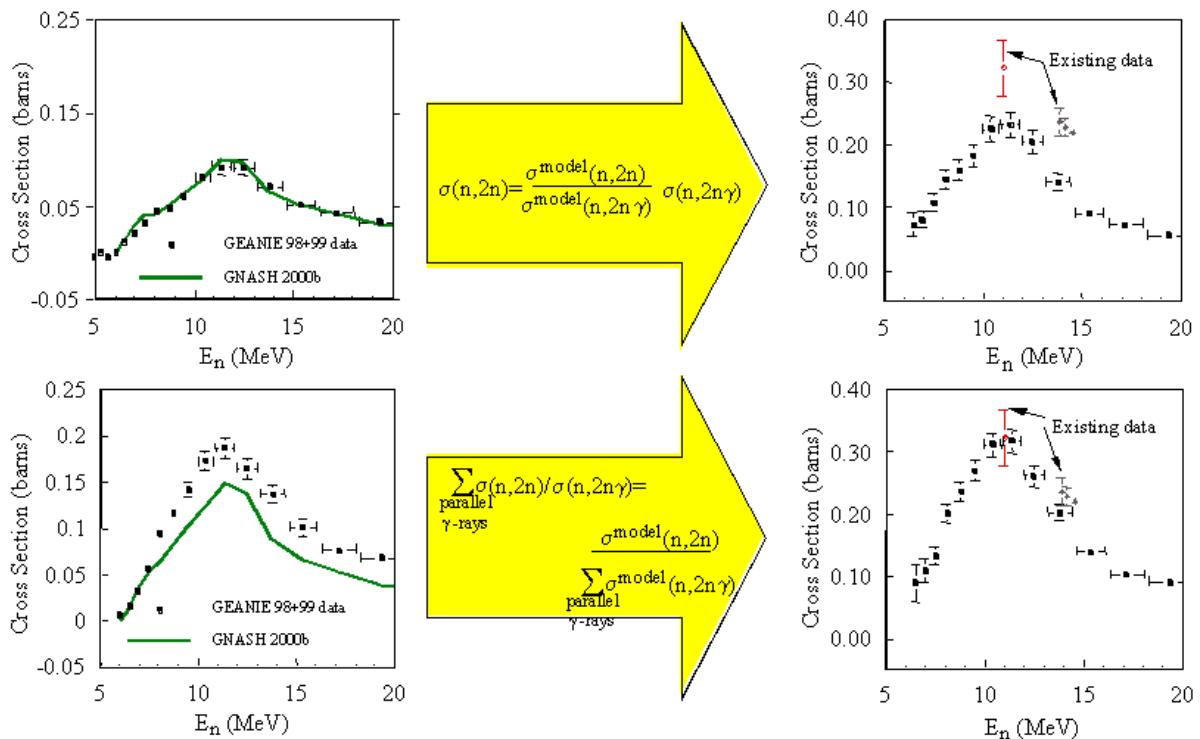
Determine the yield  
of a given  $\gamma$ -ray  
transition accurately  
-- get partial  $\gamma$ -ray  
cross section.



# $^{238}\text{U}(\text{n},\text{xn})$ Partial Cross Sections

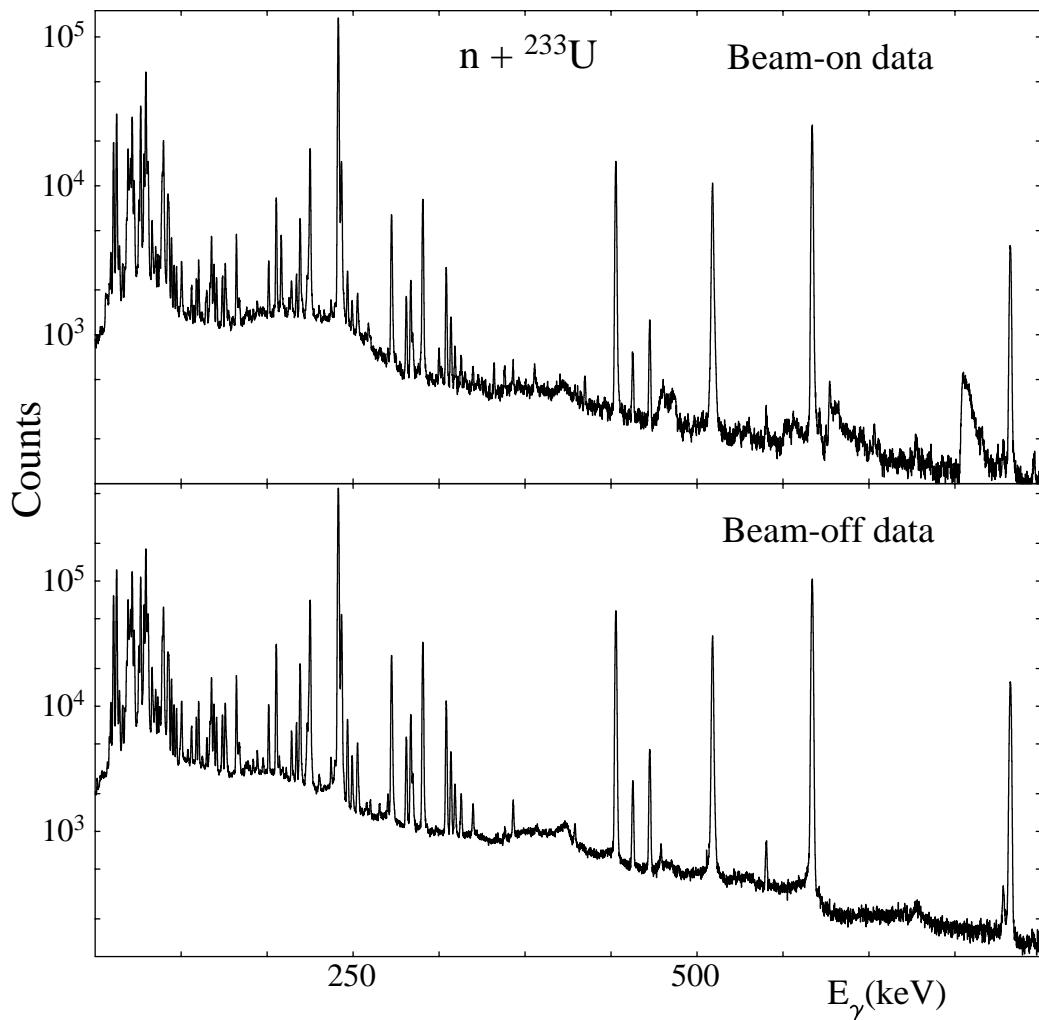


# $^{239}\text{Pu}(n,2n)^{238}\text{Pu}$ Cross Section



# What about harder cases?

**$^{233}\text{U}(n,2n)$**



# RIA

- Intense source of “rare” isotopes
- Much improved  $\gamma$ -ray detection:
  - GEANIE is 26 “small” Ge detectors (eff @ 1 MeV < 1%)
  - GAMMASPHERE is 110 large Ge detectors (eff ~ 10%)
  - Better detectors in the making: GRETA and GARBO (eff ~ 50%)

# But what experiments can be done?

- Use beams of “rare” isotopes, not targets
- Cross sections for  $p(X,X')$ ,  $d(X,X')$ ,  $\alpha(X,X')$ , etc.
- $n$ -induced cross sections still difficult...need better techniques
  - radiochemical techniques
  - other
  - or a neutron target...

# Collaborators

- N. Fotiades, R.O. Nelson, G.D. Johns, D. Drake, LANL
- L.A. Bernstein, J.A. Becker, P. Garrett, C. A. McGrath, D. McNabb, W. Younes, LLNL